BENEFITS OF THERMOSTATIC STEAM CONTROL

REDUCE COSTS AND PREVENT LIVE STEAM LOSSES WITH THERMOSTATIC STEAM CONTROL

During the frigid winter months, exposed fluid-carrying piping and systems must be properly winterized to keep them from freezing. Without adequate protection from heat loss, low temperatures can easily result in frozen lines, increased liquid viscosity, and costly damage to sensitive equipment.

To prevent process interruptions, facilities turn to heat tracing to keep their systems operating, even in the face of harsh winter conditions.

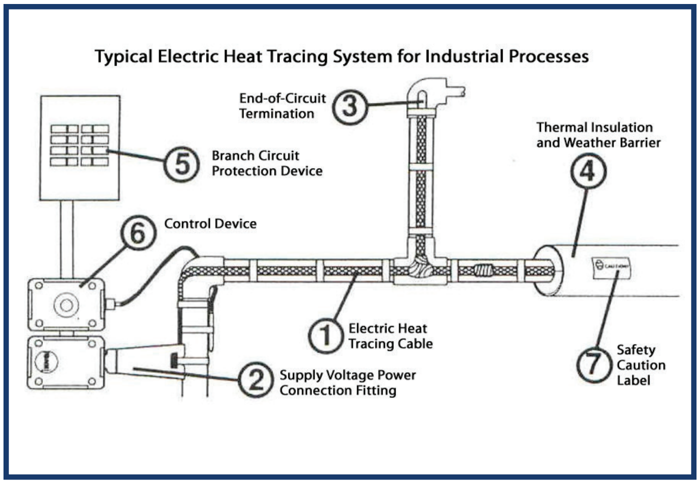
Comparing Electric Tracing vs. Steam Tracing

Heating systems most often use either steam or electricity to prevent freezing. Electrical tracing utilizes a heating cable, which is installed directly adjacent to the system to be protected. Usually self-limiting, the heating cable automatically adjusts heat output based on surface temperature.

A constant wattage heat cable can be used to provide a constant heat output that is not affected by varying ambient or pipe content temperatures and controlled with an integrated thermostat if preferred.

While an effective method to prevent freezing with great control, the use of electrical tracing presents several complicating factors to be considered:

- In installations with lengthy piping systems, the electricity required to maintain temperature can incur a substantial expense over the freeze season.
- If combustible substances are present, there is an inherent risk posed by electrical sparks, making electrical tracing unsuitable for use in areas with explosion-proof requirements.
- Should the cable break or fray, everything beyond the interruption would likely freeze.



Even worse, for systems with complicated and inter-twined processes, the damaged section may be difficult to detect until freezing has already occurred.

In steam tracing systems, a copper or stainless-steel tube is traced around or along the process to be protected and supplied with steam. Steam tracing is still the preferred heat tracing method for industrial facilities with extension pipe runs and a pre-existing steam supply.

Steam has a high latent heat. It is an effective heating medium and does not create electrical sparks like its alternative, electric heat tracing, making it the ideal solution for explosion-proof environments.

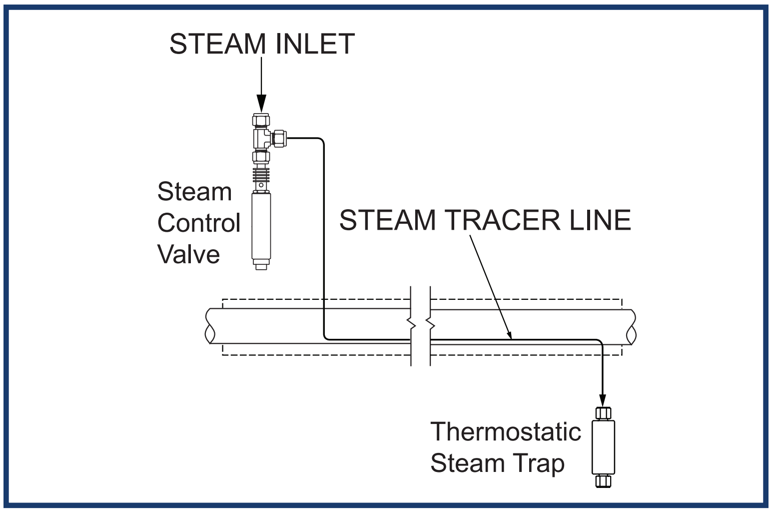
While a convenient and practical tracing method for most industrial facilities, steam tracing can quickly become costly if not properly controlled.

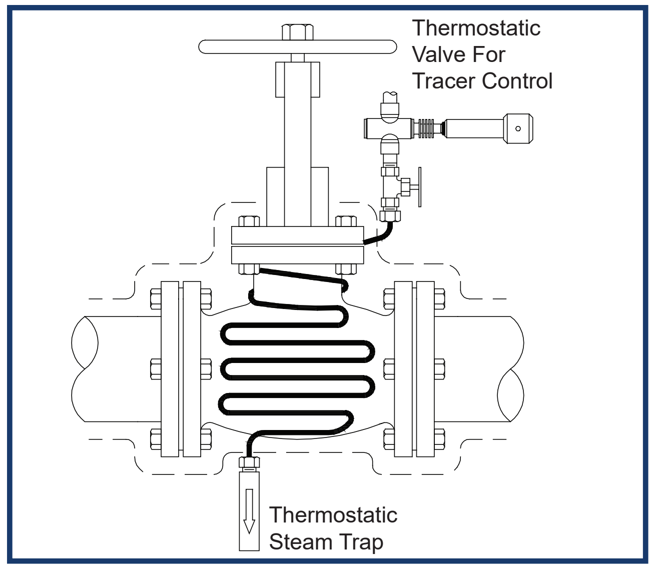
Steam Tracing Control Options

Properly controlling steam tracing is critical to effectively utilizing the heating media and minimizing overall expenses throughout the freeze season.

Typical winterization procedures at a plant require steam tracing to be turned on during periods of cold weather when temperatures could drop below freezing. Since temperatures fluctuate throughout the winter period, many plants manually turn on the trace system at the beginning of their winter season and leave it on until Spring.

While this eliminates the chance of freeze damage from forgetting to activate the steam on any particular day, it wastes a lot of steam on those days when temperatures are above freezing. A better solution is to install thermostatic valves to control steam flow automatically.





These self-actuating valves can sense the ambient or surface temperature and will regulate the steam on and off based on the specified set-point of the valve. By relying on an automatically operated system to manage steam tracing, you can save thousands of dollars and eliminate errors associated with manual operations.

The example on the below details the exorbitant savings a facility could experience using thermostatic control valves.

Manual Vs. Automatic Control of Steam Tracing Supply

EXAMPLE SYSTEM: A winterizing steam tracing system in a plant located in Philadelphia, PA consumes about 500 lbs. per hour of steam. This system was manually turned on when danger of freezing temperatures approached (mid-September) and turned off in late Spring when danger of freezing had passed (mid-April). Total operating hours are an estimated 5,088:

212 days x 24 hours = 5,088 hours in potential freeze season.

COST OF MANUALLY OPERATED SYSTEM:
If the plant's steam cost is $8.00 / 1,000 lbs. of steam, operating costs can be calculated as follows:

500 lbs. per hour x 5,088 hours x $8.00/thousand lbs. = $20,352.00 per winter season.

COST OF AUTOMATICALLY OPERATED SYSTEM:
When using thermostatic ambient sensing valves, steam tracing is turned off automatically whenever ambient temperatures rise above 45°F (other closing temperatures can also be specified). Based on U.S. Weather Bureau data for Philadelphia, steam will be on for only 2,895 hours each winter.

500 lbs. per hour x 2,895 hours x $ 8.00/thousand lbs. = $11,580.00 per winter season.

SAVINGS REALIZED PER WINTER SEASON BY USING THERMOSTATIC VALVES:

$20,352.00 less $11,580.00 = $ 8,772.00 per year

CONCLUSION: Assuming an install cost of $500, the simplified payback on investment (R.O.I.) for this example system using thermostatic valves is:

$8,772.00 ÷ $500.00 = 17.5 R.O.I.

*See graph below for estimated savings per tracer geographically.

Estimated Savings Per Tracer Geographically

Location	Number of Months Annually That Air Temps Can Fall to 32°F or Lower	Normal Hours Below 45°F	% Of Steam Saved During Months Freeze Can Occur	Dollars Saved Annually, With Tracers on During Months Freezing Can Occur				Dollars Saved Annually, With Tracer on 12 Months			
				Winterization Steam Use, lb/hr				Winterization Steam Use, lb/hr			
				10	20	30	50	10	20	30	50
Great Falls, MT	9	4152	36	186.62	373.25	559.87	933.12	359.42	546.05	732.67	1105.92
Buffalo, NY	8	3829	34	156.67	313.34	460.42	783.36	387.07	543.74	690.82	1013.76
Charleston, WV	7	2716	46	185.47	370.94	556.42	927.36	473.47	658.94	844.42	1215.36
Charlotte, NC	6	1769	59	203.90	407.81	611.71	1019.52	549.50	753.41	957.31	1365.12
Chicago, IL	8	3838	33	152.06	304.13	456.19	760.32	382.46	534.53	686.59	990.72
Cleveland, OH	8	3499	39	179.71	359.42	539.14	898.56	410.11	589.82	769.54	1128.96
Houston, TX	5	229	94	270.72	541.44	812.16	1353.60	673.92	944.64	215.36	1756.80
Los Angeles, CA	2	117	92	105.98	211.97	317.95	529.92	739.58	787.97	893.95	1105.92
Memphis, TN	6	1829	58	200.45	400.90	601.34	1002.24	546.05	746.50	946.94	1319.04
Mobile, AL	4	759	74	170.50	340.99	511.49	852.48	631.30	801.79	972.29	1313.28
New Orleans, LA	4	468	84	193.54	387.07	580.61	967.68	654.34	847.87	1041.41	1428.48
New York, NY	6	2856	34	117.50	235.01	352.51	587.52	463.10	580.61	436.32	933.12
Philadelphia, PA	7	2895	43	173.38	346.75	520.13	866.88	461.76	634.75	808.13	1154.88
Pittsburgh, PA	7	3512	30	120.96	241.92	362.88	604.80	408.96	529.92	650.88	892.80
Portland, ME	8	4140	28	129.02	258.05	387.07	645.12	359.42	488.45	617.47	875.52
St. Louis, MO	7	2838	44	177.41	354.82	532.22	887.04	465.41	642.82	820.22	1175.04
Seattle, WA	6	2915	33	114.05	228.10	342.14	570.24	460.48	573.70	687.90	915.84
Tulsa, OK	6	2127	51	176.26	352.51	528.77	881.28	521.86	698.11	874.37	1226.88

Steam Traps Options

Steam traps are an essential component of steam tracing systems to purge condensate and non-condensable gas that form in steam lines.

It is necessary to use steam traps in steam lines to avoid unwanted condensate from entering a system. The traps allow steam to reach its destination remaining as dry and clean as possible. Condensate entering the steam system can result in inefficient operation, reducing the heat transfer area and heater performance which can be economically damaging due to corrosion, water hammer, and accumulated dirt.

Conventional steam trap design limitations often result in live steam losses and temperature variations on piping, which may affect their supply processes.

An economical alternative to conventional steam traps is thermostatic steam traps. These self-actuating thermostatic valves bleed off condensate from the traced system only once the condensate has fallen well below the saturated steam temperature of the valve’s set-point temperature. The condensate forms a liquid seal ahead of each valve, preventing live steam losses.

Conventional vs. Thermostatic Trap Operating Costs

Most properly functioning conventional steam traps have inherent live steam losses: at least 2 lbs./hr. for inverted bucket traps, and over 5 lbs./hr. for disc traps.

In addition, studies have shown that the live steam losses associated with disc traps increase considerably with the length of time in service, often with losses of 20 lb./hr. after less than one year of service. Losses from other types of conventional traps also increase with time.

To gauge the overall difference in operating costs when using conventional or thermostatic steam traps, we will use 2 lb./hr. of live steam loss for conventional traps in good condition and compare this to ThermOmegaTech’s HAT thermostatic valves which have zero live steam loss.

The calculation also considers that the thermostatic HAT valve discharges condensate at a lower temperature than conventional traps, thus accruing additional savings. These additional savings are calculated based on the value of the heat content at varying discharge temperatures.

Example System Conditions:

One hundred 3/8” steam tracers (50 to 75 feet long)

70 PSIG steam pressure (316°F saturated steam temperature)

Assumed steam cost @ $8.00/1000 lbs or $8.00/1,000,000 BTU

Estimated individual trap load: 20 lb/hr

Total system load: 100 X 20 lb/hr = 2000 lb/hr

Example System Heat Savings Calculations:

SENSIBLE HEAT SAVINGS:

286 BTU/lb - 133 BTU/lb = 153 BTU/lb Saved by ***thermostatic valves***

2000 lb/hr X 153 BTU/lb X 8760 hr/yr X $8/1,000,000 BTU:

Annual Savings Based On Reduced Condensate Temperature: $21,445

ANNUAL COST OF LIVE STEAM LOSS FOR CONVENTIONAL TRAPS:

2 lb/hr per trap X 100 traps X $8/1000 lbs X 8760 hr = $14,016

SUMMARY OF ANNUAL SAVINGS FOR EXAMPLE SYSTEM

	3/8 TV/HAT	CONVENTIONAL TRAPS
SAVINGS OF LIVE STEAM LOSS	$ 14,016	$0
SAVINGS FROM SENSIBLE HEAT	$ 21,445	$0
TOTAL SAVINGS:	**$ 35,461**	**$0**
SAVINGS PER TRAP	**$ 354**	**$0**

Following the example system calculation cited above, a typical steam tracing system using ThermOmegaTech's thermostatic steam trap valves can save at least $354 per valve, per year.

When taking into account further associated costs, including valve cost and elimination of installation labor, the simplified return on investment (ROI) is an estimated 4.02 or 402%.

Selecting the Appropriate Steam Tracing Components

A successful steam tracing system is no more than the sum of its parts – high-quality parts mean an effective and economical system that will keep your processes functioning and freeze-free, no matter the weather.

For this reason, the selected components should be both durable and well-designed. Brass or stainless-steel mechanisms are highly recommended, as these materials prevent corrosion that can interfere with the operation and shorten operating life.

Thermostatic steam control valves should be installed to monitor and control steam tracing. The steam traps should be thermostatic to prevent live steam losses and significantly reduce operating costs.

Winter weather may be inevitable, but its effect on your facility can be mitigated with proper planning. With a well-designed steam tracing system comprised of high-quality components, your facility will be freeze-free for years to come.